Safe Working Practices for SNL/NM Center 1100

Part A: PHS Information

PHS Identification
PHS-SNL07A00126-004 CINT Rm: 1527 – Etch Lab
Hazard Classification: Low
NEPA SNA07-0202 - CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

This completed SWP meets the requirements of a Job Safety Assessment as specified by the Work Planning and Controls manual.

Laboratory Owner
John Nogan, 1132, 284-8863

Brief Description of R&D Work Performed in this Laboratory
Bay 1527 has two inductively coupled plasma (ICP) etch systems and a plasma enhanced chemical vapor deposition (PECVD) system. The PECVD system allows the conformal deposition of multiple types of dielectric and other materials, such as poly-Si, silicon nitride, and silicon oxides. The ICP etch systems are used for etching for dry etching aluminum, carbon, oxides, nitrides, polysilicon, among other materials. Etch systems utilize an interferometer with class 2 laser for in-situ thin film measurement and endpoint. Non-toxic gasses are stored in chase #1530 and plumbed into bay 1527, whereas the toxic gasses are self-contained within built-in toxic gas cabinets in each tool. There are toxic gas monitoring sensors located in each of the gas cabinets and in the vicinity of the tools to detect leaks. An ellipsometer with class 3a laser provides a means for thin film thickess and refractive index measurement. Additionally, a scanning laser 3a tool, called a flexus, is located in 1527 and used to measure wafer curvature. The system is interlocked for safety purposes.

The Toxic Gas Monitoring System (TGMS) system is comprised of a decentralized Life Safety Network based on the LonWorks Technology with intelligent network nodes. The digitally networked input/output devices will notify personnel and shut down equipment based on a program customized for the requirements of the CINT Integration Labs.

Network devices include Honeywell (MST Technology) Satellite FTT gas monitors, Echelon digital interface modules, bus monitors, a Local Information Display and DVS (Data Visualization System). Output devices include beacons/horns, relay shut down of gases and signals to the Sandia Fire Protection panel for notification to the Sandia Emergency Operation Center.

Part B: Operations Identification, Hazards and Mitigation

Short Title of Laboratory Operations Category: Chemical Usage
Rigor Level: Medium

Description of Laboratory-Specific Operations that Involves Chemical Hazards:
Toxic Gases: Ammonia, Boron Trichloride, Silane, Chlorine

The gases of concern are Ammonia (1 lb), Chlorine (1 lb), Boron Trichloride (1 lb) and Silane (8 lbs). All are contained within gas cabinets which are designed to shut down upon detection of any leaks.

All activities that involve chemicals will follow the laboratory practices outlined in SNL/NM Center SOP1100.00 Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories.

Applicable Technical Work Documents:	**Required Training:**
• SOP1100.001 Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in SNL/NM Center 1100 Laboratories • Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out	• ESH100 ES&H Awareness • LAB100 Laboratory Standard Information and Training • LAB103 Site-Specific Laboratory Safety Training • ENV112 Hazardous Waste and Environmental Management • ILUA Integrated Lab Unescorted Assess Training
These documents are required reading for all authorized workers.	**These courses are required training for all authorized workers.**

Possible Chemical Hazards:
• Toxic Gases
  • Flammable
  • Inhalation
  • Explosion
	Mitigation of Chemical Hazards:
	The system is designed to shut off the gas if it were detected within the gas cabinet.
	
	Personnel have read and signed off on the operating procedure.
	
	A warning device/alarm consists of a high level alarm which will activate upon the detection of a leak at 3 times the Threshold Value Limit. A high level alarm also activates the fire alarm, notifying personnel to evacuate the building.
	
	Personnel have completed site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

Short Title of Laboratory Operations Category: Environmental **Rigor Level: Low**	
Description of Laboratory Operations Category: Toxic gases are used in these operations.	
Applicable Technical Work Documents: • SOP1100.001 Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in SNL/NM Center 1100 Laboratories **These documents are required reading for all authorized workers.**	**Required Training:** • LAB100 Laboratory Standard Information and Training • LAB103 Site-Specific Laboratory Safety Training • ENV112 Hazardous Waste and Environmental Management. • ILUA Integrated Lab Unescorted Assess Training **These courses are required training for all authorized workers.**
Resulting Hazards: • Air Emissions	**Mitigation of Identified Hazards:** Sensors are present in the cabinets which shut down the system if a leak is detected. Sensors with alarms and warning lights are also present in the chase area. The warning lights are also in the main clean room areas.

Short Title of Laboratory Operations Category: Pressure hazards **Rigor Level: Low**	
Description of Laboratory Operations Category: The toxic gases are contained in small lecture gas cylinders which are housed in ventilated gas cabinets.	
Applicable Technical Work Documents: • Pressure Safety Data Packages **These documents are required reading for all authorized workers.**	**Required Training:** • PRS150 Pressure Safety Orientation (All operators) • PRS250 Advanced Pressure Safety (Installers only) **These courses are required training for all authorized workers.**
Resulting Hazards: • Explosion • Asphyxiation • Bodily injury • Eye injury	**Mitigation of Identified Hazards:** All procedures are done in accordance with guidelines in the Pressure Safety Manual. Gas cylinders are housed in gas cabinets and are equipped with pressure relief valves (PRVs). All pressurized systems or tubing networks are regulated by approved gas-specific pressure regulators and are fit with PRVs. Safety glasses are worn at all times when dealing with pressurized systems.

Continuous Improvement and Feedback

This SWP document must be reviewed, revised (if necessary), and re-signed at least annually in conjunction with PHS renewal. This SWP must be revised earlier in response to:

- new hazards (e.g. chemicals) being introduced in to the laboratory,
- recognition of hazards not previously considered, or
- identification of significant improvements to hazard control/mitigation defined in this document,

and other situations where improvement to laboratory safety should be documented. It should be noted that these same conditions may require revision of the laboratory PHS and required training matrix.

Reviews and Approval

Prepared by Laboratory Owner

John Nogan — John Nogan — 2/4/10
Printed Name — Signature — Date

Reviewed by CINT ES&H Coordinator

Michael Starr — Michael D Starr — 2/5/10
Printed Name — Signature — Date

MDS Center ES&H Coordinator initials here designate that further review by Industrial Hygiene or other Subject Matter Experts is not required.

Reviewed by Center Industrial Hygienist as required

Printed Name — Signature — Date

Additional SME Review required by Center ES&H Coordinator or Department Manager

Reviewer — Title/Activity — Signature — Date

Additional SME Review required by Center ES&H Coordinator or Department Manager

Reviewer — Title/Activity — Signature — Date

Approved by Department Manager

By approving the SWP, the Department Manager attests that it is an appropriate assessment of the ES&H risks associated with the R&D activities that are authorized to take place in the designated lab(s). The approval signature further indicates that the hazard mitigations specified in this SWP are also appropriate.

Sean Hearne
Printed Name — Signature — Date

Authorized Worker Agreement:

Signature by the Authorized Workers in the following Summary Authorization Table certify that the worker has read, understood, and agree to follow the Safe Working Practices identified in this document. Authorized Workers agree that they will not introduce hazards into this laboratory that are not covered by the PHS, SWP, and related documents."

If a new employee (e.g. student, post doc, etc) is brought in to work in the laboratory, their training must be evaluated by the manager prior to any work being assigned or conducted. Their signature asserts that this has been done.

Printed Name	Signature	Date	Lab Owner Confirm. (initials)	Chemical Operations	Environmental	Pressure Hazards								

Rigor Level M L L